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A NEW LIZARD OF THE GENUS *AMPHIBOLURUS* (AGAMIDAE) FROM SOUTHERN AUSTRALIA

By Geoffrey J. Witten* and A. John Coventry†

* Department of Anatomy and Physiology, Phillip Institute of Technology, Plenty Road, Bundoora, Victoria 3083.
† Division of Natural History and Anthropology, Museum of Victoria, 285 Russell Street, Melbourne, Victoria 3000.

Abstract: A new species of the genus *Amphibolurus* is described from the mallee heath belt of northwestern Victoria, eastern South Australia and the Eyre Peninsula. Its relationships with its congeners and the closely related *Caimanops* are discussed. Morphometric data for these species are presented.

During research in both the Big and Little Desert mallee country of western Victoria, lizards closely resembling *Amphibolurus nuricatus* were collected. Examination of specimens from this population and museum specimens from the South Australian Museum revealed the presence of two species, one of which has not previously been described. Material is housed in the Museum of Victoria (prefix D) or the South Australian Museum (prefix R).

SYSTEMATICS

Amphibolurus norrisi sp. nov.
Figs 1, 2

1978 *Amphibolurus muricatus* (part) Houston, p. 38.

Holotype: D51499, an adult male from 29 km S of Nhill in 36°36'S, 141°38'E, collected by A. J. Coventry and K. C. Norris, 5 Oct. 1978.

Paratypes: There is a total of 40 paratypes, 20 males, 15 females and 5 juveniles. All are from the Little Desert in the Victorian Wimmera. D8944, Kiata; D14799, Broughtons Waterhole; D14800-1, 3.2 km NE of Broughtons Waterhole; D14802-3, D14810, Stans Camp, approx. 22.5 km SW of Nhill; D14804, D14809, 1.6 km E of Broughtons Waterhole; D14808, 10.5 km E of Broughtons Waterhole; D14805-7, D14813, 1.6 km ESE of Broughtons Waterhole; D14811, Kiata Lowan Sanctuary; D14812, 4 km W of Broughtons Waterhole; D33526-7, Little Desert; D51482, D51500, 12 km S of Winiam; D51491, 33 km S of Nhill; D51507, 3 km S of Broughtons Waterhole; D51512, 10 km S of Winiam; D51521, 35 km S of Nhill; D51576, 8 km SSW of Kiata; D51597, D51626, 24 km S of Kiata; D51608, D51771-2, Salt Lake, 18 km S of Kiata; D51617, 25.5 km S of Kiata; D51752, 18 km NE of Goroke; D51759, 10 km SW of Kinimakatka; D51763, 15 km SW of Kinimakatka; D51764, 15 km NE of Goroke; D51765-6, Chinamans Flat, 5 km E of Broughtons Waterhole; D51783, 23 km S of Kiata; D51786, 8 km SE of Winiam; D52230, 25 km SW of Kaniva.

Diagnosis: Lateral scales at least moderately heterogeneous, usually with a mid-lateral row of enlarged mucronate scales. Dark line running along the canthus rostralis from tip of snout to orbit. Dorsum of snout with or without a median dark stripe extending forward from between the orbits, no transverse dark marks on snout.

Description: Relatively large agamid lizard with limbs and tail of moderate length in adults, but short in hatchlings. Somewhat elongate in form. Very similar in scutellation to *A. nuricatus*, differing in having a less prominent nuchal crest and vertebral scale ridge. Two dorsal rows of enlarged mucronate scales on either side, and usually a third on the lateral aspect of the body. Both dorsal and lateral scales strongly heterogeneous in adult. Dorsal scales in rows parallel to, or weakly convergent upon, midline. Gular scales feebly keeled to smooth. Pre-nasal scales 4-6, subnostril scales 3-5, supralabials 13-17, infralabials 10-15, mid-body scale rows 84-106, lamellae under fourth toe 24-28. Preanal pores 4-11 (m = 6.4, n = 117), femoral pores 4-8 (m = 5.6, n = 117), on posteroinferior aspect of thigh.

General colour from slate grey to brown patterned with dark grey to black markings. Sides below dorsolateral skin fold darker. Broad median dark stripe, with or without transverse connections to the dark lateral area forming a series of lozenge-shaped lighter areas. Tail with obscure dark blotches at base, becoming progressively more distinct and forming bands on the distal half of the tail. Temporal and occipital regions with fine dark reticulations. Dark stripe from eye to tympanum, bordered above with a narrow paler stripe. Lower labials very pale to white. Upper and lower lips pale, the pale area extending posteriorly onto jowls (Fig. 1), this latter area occasionally tinged orange. Lining of mouth pale yellow.

Description of Holotype: Snout-vent (SVL) length 69 mm, tail 143 mm, femoral pores 4 (2 on each side), preanal pores 7 (4 on right, 3 on left). Dorsal scales weakly convergent on midline, gular scales very feebly keeled. Prenasal scales 5, subnostril scales 5, supralabial scales 15, infralabial scales 15, mid-body scale rows 104.

Distribution: Mallee heath belt of northwestern Victoria, extending westward into South Australia. A separate population on Eyre Peninsula, extending onto the coast of the Great Australian Bight (Fig. 2).

Etymology: This species is named in honour of Kenneth Charles Norris, formerly of the Victorian Fisheries and Wildlife Department Survey Team, in recognition

Fig. 1—*A. norrisi* from Chinaman Well area, Big Desert.

of his contributions to the knowledge of the Victorian vertebrate fauna.

Other Specimens Examined:

Victorian localities—D51668, D51729, 18 km W of Ranger's Office, Wyperfeld National Park; D52550, D52654, D52696, D53010, D53072, D53854, D54154, D54202, D55004, 0.2 km NE of Chinaman Well; D52557, D52677, D53069, D54793, D55458, 2 km NNW of Chinaman Well; D52562, D53501, D54095, D54119, 2.8 km NE of Chinaman Well; D52632, D52687, D53051, D54028, D54127, D54150-2, D54942, D54976, 2.75 km NNW of Chinaman Well; D52678, 4.7 km ENE of Chinaman Well; D52693, 6.6 km ENE of Chinaman Well; D52751, 2 km S of White Springs (i.e. 21 km S of Tutye); D52758, 22 km S of Tutye; D52996, D53470, D54027, D54124, D54755, D54966, 3.3 km NNW of Chinaman Well; D53057, D53077, D53965, D56740, 5.1 km NNW of Chinaman Well; D53465, D53916, D54143, D54646, 6.2 km ENE of Chinaman Well, D53466, D53855, 3 km NE of Chinaman Well, D53488, 2.2 km NNE of Chinaman Well; D54094, 16.6 km ENE of Chinaman Well; D54794, 1.7 km NNW of Chinaman Well; D54928, D54935, 2.65 km SE of Chinaman Well; D54967, 1.3 km N of Chinaman Well; D54968, 2.25 km NW of Chinaman Well; D54977, 4.4 km NNW of Chinaman Well; D55035, 2.7 km NNW of Chinaman Well; D55267, 5.7 km NNW of Chinaman Well; D55606, 1.3 km N of Chinaman Well; R10880, Moonlight Tank.

South Australian localities—R1454, Tintinara; R2359 A-B, Coombe; R3269 A-C, 'Euringa', Naracoorte; R4304, 24 km N of Fowlers Bay; R9006, County Chandos; R10134, R10138, R13550, Hincks National Park; R10177, Hund. of Blesing; R13355, Bookmark Station; R13549, 18 km ESE of Halidon; R13926, sec 17, Hund. of Jamieson, Eyre Peninsula; R14197, N/R Minaro Downs Station, between Polda and Wudinna; R16057, Lincoln National Park; R16171, about 47 km S of Lameroo, 11 km W of Verran Hill, Hincks National Park; R16681, Billiat Conservation Park, 34° 55′S, 140° 20′E; R21446, R21472, Naracoorte, about 36° 40′S, 140° 00′E; within 5 km Wirrildee Station; R21951, Naracoorte, about 36° 40′S, 139° 59′E; Wirrildee, about 25 km E of Kingston; R23783, Lincoln, 34° 51′S, 135° 57′E; Lincoln National Park.

Discussion: *Amphibolurus norrisi* is in some respects intermediate between *A. muricatus* (White 1790) and *A. nobbi coggeri* Witten 1972. It is very similar to the former in scutellation, but in colour pattern and ecology appears to more closely resemble *A. nobbi coggeri*. In the eastern part of its range it occurs to the north of the distribution of *A. muricatus*. *A. nobbi coggeri* and *A.*

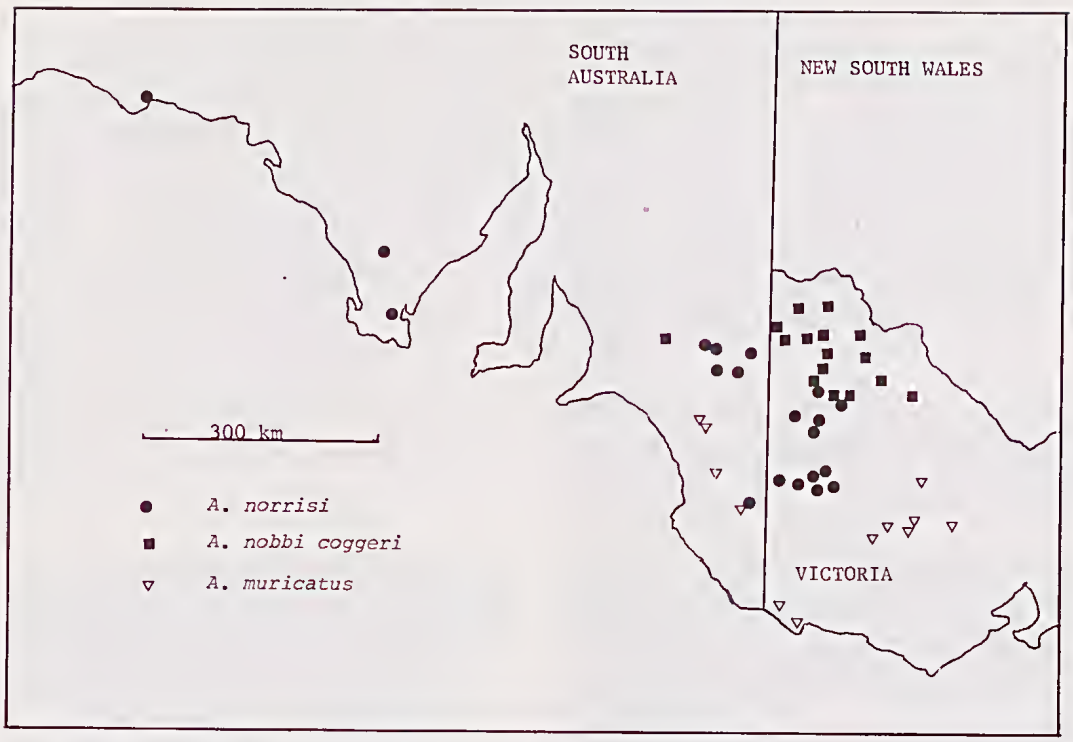

Fig. 2—Map showing distribution of *A. norrisi*, with *A. muricatus* and *A. nobbi coggeri* from adjacent areas.

norrisi are sympatric in the northern part of the range of *A. norrisi* east of Spencer's Gulf (Fig. 2). Mather (1979) and Menkhorst (1982) reported this sympatry in the Victorian part of the range (reporting *A. norrisi* as *A. muricatus*), and the area of sympatry probably extends into South Australia (Houston 1978).

A. norrisi and *A. muricatus* are readily distinguishable from *A. nobbi* by their more heterogeneous dorsal and lateral scalation. *A. norrisi* differs most strikingly from *A. muricatus* in colour pattern. The most consistent difference is the presence of a dark canthal stripe in *A. norrisi*. Rare specimens of *A. muricatus* have a dark canthal stripe from the tip of the snout to the nostril, but this stripe does not continue back to the orbit as it consistently does in *A. norrisi*. Also, *A. muricatus* often possess transverse dark markings on the snout, running between the nostrils. Such markings are never present in *A. norrisi*, where the only dark dorsal snout marking is a median longitudinal stripe. This median stripe may extend as far anteriorly as the level of the nostrils, but does not extend to the snout tip.

A. norrisi has generally more scales than other *Amphibolurus* (Table 1). In this it resembles *Caimanops*. However, *A. norrisi* has small scales in the loreal region, with a generally higher number of prenostril and subnostril scales than other *Amphibolurus* and *Caimanops* (Table 1). *A. norrisi* is also distinct from other taxa in this group by virtue of its relatively smooth gular scales.

The recorded number of supralabial scales in most agamids is subject to wide variation. Often the supralabial series of elongate scales continues posteriorly beyond the lip, and these posterior scales *sensu stricto* are not supralabials. Various authors have chosen to count only scales on the upper lip, the whole series, or only those scales anterior to the tendon of *levator labii inferioris*, the effective angle of the mouth. The number of infralabial scales is not so prone to observer variation, and should be preferred in taxonomic work on agamids (Witten 1982).

The number of pores is higher in *A. norrisi* than in other *Amphibolurus* (Table 1). *A. norrisi* most commonly has 6 preanal and 6 femoral pores. *A. nobbi* typically has 6 preanal and 4 femoral pores, whereas *A. muricatus* has 6 femoral and 4 preanal pores (Witten 1972a).

A. norrisi appears to be more elongate than both *A. muricatus* and *A. nobbi*. This appearance is certainly enhanced by differences in colour pattern. A preliminary morphometric analysis reveals little variation between three species of *Amphibolurus* (Table 2). *A. norrisi*, however, has a narrower head than other *Amphibolurus*, which is consistent with a more elongate form. *A. norrisi* has a slightly narrower tympanum, and the forelimb and thigh measurements are less than for other *Amphibolurus*. In these measurements *A. norrisi* deviates from other *Amphibolurus* in the same direction as *Caimanops* (Table 2). In each case *Caimanops* is

TABLE 1
COMPARATIVE SCALE COUNTS FOR *Amphibolurus* AND *Caimanops*†

	A. norrisi		*A. muricatus*		*A. nobbi*		*C. amphiboluroides*	
	Range	Mean ± SD(N)	Range	Mean ± SD(N)	Range	Mean ± SD(N)	Range	Mean ± SD(N)
PNS	4-6	4.89 ± 0.7(19)	3-5	3.58 ± 0.7(12)	3-5	3.62 ± 0.6(16)	3-5	4.09 ± 0.6(23)
SNS	3-5	4.37 ± 0.8(19)	3-4	3.42 ± 0.5(12)	2-4	3.19 ± 0.5(16)	2-5	3.00 ± 0.7(23)
INS	9-13	11.6 ± 1.1(17)	9-13	11.5 ± 1.4(12)	11-13	11.4 ± 0.6(16)	5-9	6.78 ± 0.9(23)
SLS*	10-14	12.7 ± 1.2(19)	10-14	11.8 ± 1.1(12)	8-11	10.0 ± 1.0(16)	11-15	12.8 ± 1.2(23)
ILS	10-15	12.9 ± 1.3(19)	9-13	11.2 ± 0.9(12)	9-11	10.0 ± 0.7(16)	11-14	12.3 ± 1.1(23)
MBS	84-106	98.7 ± 7.1(16)	72-97	87.3 ± 6.8(11)	64-75	68.7 ± 3.2(16)	93-131	107 ± 9.9(20)
PP	4-11	6.44 ± 1.2(117)	3-6	4.08 ± 0.8(12)	4-6	5.44 ± 0.9(16)	2-6	3.81 ± 1.1(21)
FP	4-8	5.63 ± 1.0(117)	4-7	5.83 ± 1.1(12)	2-4	2.75 ± 0.9(16)	0-2	0.09 ± 0.4(21)

PNS = Prenostrils; SNS = Subnostrils; INS = Internostrils; SLS = Supralabials; ILS = Infralabials; MBS = Mid-body scales; PP = Preanal pores; FP = Femoral pores.
* Supralabials counted following the methods of Witten (1982), counting only scales anterior of the tendon of levator labii inferioris.
† Data for species other than *A. norrisi* from Witten (1982).

much further from *Amphibolurus* than is *A. norrisi*, and we do not consider the generic status of *Caimanops* needs to be questioned at this stage. However, as *A. norrisi* also resembles *Caimanops amphiboluroides* in colour pattern and in several scale characters it seems very likely that *A. norrisi* is more closely related to *Caimanops* than are the other species of *Amphibolurus*. This apparent relationship indicates that the nearest relatives to *Caimanops* are in *Amphibolurus* and not *Diporiphora*, the genus to which it was originally referred.

It appears that Houston (1978) has based much of his description of *A. muricatus* on *A. norrisi*. His description of 'ventral scales flat and virtually smooth, feebly keeled on chest' is not descriptive of typical *A. muricatus*. The colour description of 'upper and lower lips usually whitish' also appears to relate to *A. norrisi*. The pore arrangement in '*A. muricatus*' (Houston 1978, fig. 4G) shows a specimen with 8 preanal and 6 femoral pores, a condition well within the normal range for *A. norrisi* but unusually high for *A. muricatus*.

The Eyre Peninsula population of *A. norrisi* appears to attain greater size than the population in eastern South Australia and Victoria. The largest Eyre Peninsula specimen is a female of 117 mm snout-vent length (R13926). The largest Victorian specimen is also a female of 104 mm SVL (D53488). Generally *A. norrisi* females tend to attain larger sizes than males, as is the case in *A. nobbi* (Witten 1972a). However, the largest *A. muricatus* examined were males.

Ovaries of *A. norrisi* begin to enlarge very late in winter. By early September females have oviducal eggs, and gravid females were not collected after late November. The number of eggs ranges from 3 to 7, with a mean of 4.82 (N = 17). Three females examined in late November had slightly enlarged ovaries, and convoluted

TABLE 2
MORPHOMETRIC DATA FOR *Amphibolurus* AND *Caimanops*

	A. norrisi (N = 36)			*A. muricatus* (57)			*A. n. nobbi* (19)			*C. amphiboluroides* (22)		
	a	X30	X80	a	X30	X80	a	X30	X80	a	X30	X80
Tail length	1.177	51.7	164	1.161	55.9	175	1.344	53.9	201	0.964	50.9	131
Hind Limb	0.988	21.8	57.4	0.958	23.7	60.5	1.101	21.7	63.9	1.016	16.2	44.0
Pes Length	0.902	10.2	24.8	0.877	11.4	27.0	1.050	10.2	28.6	0.963	7.0	18.1
Thigh	1.012	16.5	44.4	1.017	17.1	46.3	1.114	15.9	47.4	1.019	13.9	37.8
Fore Limb	0.921	12.5	30.9	0.945	12.8	32.2	0.979	12.8	33.4	0.956	11.8	30.1
Snout-parietal	0.773	8.00	17.1	0.773	7.99	17.1	0.752	7.71	16.1	0.833	6.69	15.1
Head Width*	1.025	7.64	16.9	1.106	7.43	17.5	1.084	7.53	17.4	0.951	7.45	15.5
Snout-ear*	1.147	8.74	21.2	1.160	8.56	21.0	1.196	8.51	21.4	1.123	9.01	21.4
Head Depth*	1.042	5.25	11.7	1.102	5.02	11.8	1.029	5.33	11.8	1.203	4.75	12.0
Ear Width*	1.241	1.33	3.46	1.308	1.31	3.61	1.370	1.47	4.25	1.079	1.44	3.31

a = allometric coefficient from the equation $x = ky^a$, where x = length of part, k = a constant, y = snout-vent length.
X30 = length of part in mm calculated at snout-vent length of 30 mm.
X80 = similar figure for s-v of 80 mm.
Thigh measurement from knee to knee with thighs perpendicular to body axis.
* regressed against snout-parietal interval.

oviducts, as did those examined in December. Females examined between January and March did not have enlarged ovaries, indicating that there is no autumn clutch of eggs as in *A. nobbi* (Witten 1972b). Hatchlings first begin to emerge in January. The smallest recorded hatchling had a SVL of 31.5 mm (recorded in February). Maturity is not attained until at least the beginning of the second breeding season (Table 3).

TABLE 3
MEAN SIZE OF IMMATURE *A. norrisi*

Month	Mean SVL	N
January	33.0	1
February	34.7	3
March	40.3 (34.7-46.7)	9
October	43.5	3
November	56.7	3

A. norrisi preys primarily on small arthropods, but the presence of one vertebrate prey item (a skink) suggests that it may be an opportunistic feeder. Table 4 lists food items found in the stomachs of *A. norrisi*.

TABLE 4
STOMACH CONTENTS FROM *A. norrisi (N=51)*.

Prey Item	Present in
Hymenoptera	
Formicoidea	66.7 (34)
Apoidea	3.9 (2)
Apocrita (Excluding above)	3.9 (2)
Coleoptera	
Scarabaeidae	58.8 (30)
Curculionidae	25.5 (13)
Lepidoptera	35.3 (18)
Hemiptera	29.4 (15)
Orthoptera	17.6 (9)
Arachnida	13.7 (7)
Blattodea	9.8 (5)
Diptera	3.9 (2)
Scincidae	2.0 (1)

'Present In' refers to the percentage of specimens in which the prey item was found, with the actual number in parentheses.

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